

Riparian Vegetation Management Task Force

Vegetative Management and Treatment Work Group

**Demonstration and Applied Research Project  
Of Integrated Management of  
Invasive Riparian Vegetation in Nebraska**

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The National Invasive Species Council defines invasive species as “*a species that is non-native to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health*”. Common reed (*Phragmites spp*), purple loosestrife (*Lythrum salicaria*), and saltcedar (*Tamarix spp*) are examples of invasive riparian weed species that are currently taking over thousands of acres of wetlands and waterways in the mid-western states including Nebraska. The challenge in Nebraska is to implement effective long-term control strategies for invasive species in riparian areas, which are ecologically and economically vital to the state.

Research has shown that a single control measure does not provide long term, sustainable, control of invasive vegetative species. Therefore, control programs should be based on an integrated approach, which includes the use of a variety of mechanical, cultural, herbicide, and biological control methods. We propose a three year demonstration and applied research project with the following objectives: (1) to demonstrate an integrated approach for riparian invasive species control based on a variety of mechanical, biological and herbicide control methods, (2) to develop “Best Management Practices” for long-term integrated control of riparian invasive species, and (3) evaluate cost-effectiveness of integrated control methods.

**Significance and benefits of the proposed project**

This is a multi-disciplinary project that involves representatives from various disciplines, including university weed science, wildlife management, local, state, and federal entities. The results from this research will help landowners, land managers, wildlife area managers, and state noxious weed regulators in several areas:

1. To optimize strategies for managing riparian invasive species over a range of growing conditions (wet land and low-laying land, etc) and to provide the most advanced knowledge on how to adjust the control method to different ecosystems. Experience from this applied research project will also help with the weed control issues in other agro-eco-system settings across the state (e.g. rangeland and pasture).
2. To reduce risks associated with invasive species competition with native plant populations and potentially reduce the loss of wildlife habitats. The increased knowledge of the effectiveness of various control methods would allow the selection of the most

efficient control strategy. For example, the applied research will provide data on the effectiveness of the proposed control methods, which will be directly applicable for management of this weed on the land that is privately or publicly owned or managed.

3. Determining the relationship between the land management practices (e.g. specific vegetation control in riparian areas, pasture or low-laying farm land) and the various control methods will improve acceptance of the concept of integrated weed management and best management practices in riparian habitat. Adoption of these practices will be more rapid when the interaction among several factors is known.

4. To strengthen active involvement of several disciplines at the university, state, federal, and private sector levels. Since riparian invasives interfere with various functions of the ecosystem and economy, their control will require a joint effort of several levels of the public and private sector.

### **List of deliverables:**

- 1.) Each site will serve a dual purpose yearly. One purpose will be to provide demonstration sites for various management methods. Demonstrations will be in the form of public meetings and field tours. The second purpose will be to provide data for the applied research project and future research manuscripts.
- 2.) Power Point presentation and a CD titled “Integrated Management of Invasive Species in Riparian habitats” will be developed. At least 10,000 copies will be produced and distributed for various Extension Activities across Nebraska to teach land managers about the “Best Management Practices” for invasive species.
- 3.) Extension Circular/Publication titled “Integrated Management of Invasive Weed Species in Nebraska ” will be developed and published through the UNL Extension Services. At least 20,000 copies will be printed, and distributed across Nebraska to teach land managers about the “Best Management Practices” for invasive species.
- 4.) Master or PhD thesis will be written by a graduate student (to be hired if project is funded).
- 5.) At least 2 scientific manuscripts will be published in the Weed Technology Journal (national and international audience).
- 6.) Items from 3 and 4 can be effectively utilized for invited presentations in neighboring states, including: Iowa, South Dakota, Minnesota, Wyoming, Kansas and Colorado, which will promote a positive image of research and extension activities from Nebraska.

### **Material and methods**

This project will be conducted at several locations, including sites along the Platte, Republican and Niobrara rivers during 2008, 2009 and 2010. A combination of

integrated weed control methods will be tested, including disking, mowing, grazing and herbicides. There will be up to four experiments at each location, as each of the four methods will be tested. Experiment 1 would be based on disking, experiment 2 on mowing, experiment 3 on grazing, and experiment 4 on herbicides. Each experiment will be arranged in a Randomized Complete Block Design with various numbers of treatments (see Tables 1-4) with three replications. Individual plot size might be from 300 ft. up to a mile long, depending the layout of the site.

Efficacy of the above control methods will be evaluated several times per season and it will be based on: (a) total stand count per meter square, (b) visual ratings of the total weed biomass reduction relative to the un-disturbed control, and (c) dry weights in each treatment at the season end. Stand counts and visual ratings will be conducted at approximately 30, 60, and 120 days after treatment (DAT) in each plot. A wire, 3-sided-square with 50 cm. long sides (total 0.25 m<sup>2</sup>) will be utilized for stand counts. The square will be placed on the ground, always at the same designated spot within the plot marked by a set of flags and GPS coordinates, and the total number of re-grown shoots will be counted and their height measured. The stand count will be repeated at the four designated spots within each plot and each replication, which will provide the total number of stems per meter squared (0.25m<sup>2</sup> x 4 = 1m<sup>2</sup>). ANOVA of plant growth responses to the control methods will be performed using PROC GLM to test data normality and significance ( $P < 0.05$ ) of the year, location, and replication. Treatment differences will be based on an LSD test.

#### **Experiment “1”: (Disking based evaluation study)**

In this applied research study, the combined effects of disking and timing of herbicide application or grazing will be tested. Experiment “1” will have a total of 6 treatments. The whole site will be disked one time, and then divided into smaller plots where grazing and herbicide treatments will be conducted according to the list of treatments (Table 1). The effects of two herbicides (Habitat or Rodeo) and two application times (Summer or Fall) will be tested. Rodeo (2qrts/acre) and Habitat (2qrts/acre) will be applied either in the summer (July) or fall (October) at the solution rate of about 15-20 gallons per acre (GPA). Depending on the results from the initial set of treatments during 2008, they will be repeated in 2009 and 2010 as needed.

#### **Experiment “2”: (Mowing based evaluation study)**

In this applied research study, the combined effects of mowing and timing of herbicide application or grazing will be tested. Experiment “2” will have a total of 4 treatments. A previously undisturbed site will be mowed, and then divided into smaller plots where grazing and herbicide treatments will be conducted according to the list of treatments (Table 2). The effects of two herbicides (Habitat or Rodeo) will be tested. Rodeo (2qrts/acre) and Habitat (2qtrst/acre) will be applied during summer (July) at the solution rate of about 15-20 gallons per acre (GPA). Depending on the results from the initial set of treatments during 2008, they will be repeated in 2009 and 2010 as needed.

### **Experiment “3”: (Grazing based evaluation study)**

In this study, the combined effects of grazing and herbicide application or disking will be tested. Experiment “3” will have a total of four treatments. A previously undisturbed site will be grazed, and then divided into smaller plots where disking and herbicide treatments will be conducted according to the list of treatments (Table 3). The effects of two herbicides (Habitat or Rodeo) will be tested. Rodeo (2qrts/acre) and Habitat (2qrts/acre) will be applied during summer (July) at the solution rate of about 15-20 gallons per acre (GPA). Depending on the results from the initial set of treatments during 2008, they will be repeated in 2009 and 2010 as needed.

### **Experiment “4”: (Herbicide based evaluation study)**

In this study, the combined effects of herbicide, herbicide application time, disking, mowing, and grazing will be tested. Experiment “4” will have a total of eighteen treatments. A previously undisturbed site will be sprayed as described in Table 4, and then divided into smaller plots where disking, mowing and grazing treatments will be conducted according to the list of treatments (Table 4). The effects of two herbicides (Habitat or Rodeo) and two application times (Summer or Fall) will be tested. Rodeo (2qrts/acre) and Habitat (2qrts/acre) will be applied either in the summer (July) or fall (October) at the solution rate of about 15-20 gallons per acre (GPA). Depending on the results from the initial set of treatments during 2008, they will be repeated in 2009 and 2010 as needed.

*Table 1.* List of treatments for disking study (Experiment “1”)

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1. Disking (June 2008) alone conducted only one time
  2. Disking (June 2008) + Herbicide (Habitat applied summer 2008, July-August)
  3. Disking (June 2008) + Herbicides (Rodeo applied summer 2008, July-August)
  4. Disking (June 2008) + Herbicides (Habitat applied Fall 2008, October)
  5. Disking (June 2008) + Herbicides (Rodeo applied Fall 2008, October)
  6. Disking (June 2008) + Grazing (July 2008 - May 2009)
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*Table 2.* List of treatments for mowing study (Experiment “2”)

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1. Mowing alone, two times (June, September)
  2. Mowing once (May, 2008) + Herbicide (Habitat applied in Summer of 2008, June)
  3. Mowing once (May, 2008) + Herbicides (Rodeo applied in Summer of 2008, June)
  4. Mowing once (May, 2008) + Grazing (2008, season long, April-October)
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*Table 3.* List of treatments for grazing study (Experiment “3”)

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1. Grazing alone (April - September)
  2. Grazing (April-July, 2008) + Herbicide (Habitat applied in Summer of 2008, August)
  3. Grazing (April-July, 2008) + Herbicides (Rodeo applied in Summer of 2008, August)
  4. Grazing (April-September, 2008) + Disking (October, 2008)
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*Table 4.* List of treatments for herbicide study (Experiment “4”)

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1. Herbicide only (Rodeo) applied in Spring (June)
  2. Herbicide only (Rodeo) applied in Fall (October)
  3. Herbicide only (Rodeo) applied in Fall (October) followed by Rodeo in Spring (June)
  4. Herbicide (Rodeo) applied in Spring (June) + Mowing (October)
  5. Herbicide (Rodeo) applied in Spring (June) + Disking (October)
  6. Herbicide (Rodeo) applied in Spring (June) + Grazing (October)
  7. Herbicide (Rodeo) applied in Fall (October) + Mowing (Spring)
  8. Herbicide (Rodeo) applied in Fall (October) + Disking (Spring)
  9. Herbicide (Rodeo) applied in Fall (October) + Grazing (December-April)
  10. Herbicide only (Habitat) applied in Spring (June)
  11. Herbicide only (Habitat) applied in Fall (October)
  12. Herbicide only (Habitat) applied Fall (October) followed by Habitat in Spring (June)
  13. Herbicide (Habitat) applied in Spring (June) + Mowing (October)
  14. Herbicide (Habitat) applied in Spring, (June) + Disking (October)
  15. Herbicide (Habitat) applied in Spring, (June) + Grazing (October)
  16. Herbicide (Habitat) applied in Fall (October) + Mowing (Spring)
  17. Herbicide (Habitat) applied in Fall (October) + Disking (Spring)
  18. Herbicide (Habitat) applied in Fall (October) + Grazing (December-April)
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**BUDGET (~ \$60,000/year)**

**Demonstration and applied research project:**

<b>YEAR 1</b>	<b>.....\$59,880</b>
<b>YEAR 2</b>	<b>.....\$59,880</b>
<b>YEAR 3</b>	<b>.....\$59,880</b>
<b>TOTAL REQUIRED FUNDS FOR 3 YEARS</b>	<b>.....\$179,640</b>

**YEAR 1 (2008)**

**A. Salaries and wages**

Cost of Graduate Student: Potential MS or PhD student will be hired to oversee the project. The hiring cost will be around \$22,000 per year .....	\$22,000
Cost of summer student helpers will be: 2 students x \$5320/year .....	\$10,640
Fringe benefits are charged at 32% for grad student .....	\$7040
<b>Total salaries, wages and benefits.....</b>	<b>\$39,680</b>

**B. Materials and Supplies**

Herbicides, additives, paper bags, flags, etc .....	\$5,000
<b>Total material and supplies .....</b>	<b>\$5,000</b>

**C. Travel (Domestic)**

The sites will cover large geography along the Platte, Republican and Niobrara Rivers, we estimated travel at 20,000 miles / year @ \$0.51/mile.....	\$10,200
Cost of lodging and meals while at sites.....	\$5,000
<b>Total travel expenses .....</b>	<b>\$15,200</b>

**Total required funds for year 1 .....**\$59,880

**YEAR 2 (2009)**

**A. Salaries and wages**

Graduate Student.....	\$22,000
Summer student helpers.....	\$10,640
Fringe benefits .....	\$7040
<b>Total salaries, wages and benefits.....</b>	<b>\$39,680</b>

**B. Materials and Supplies**

Herbicides, additives, paper bags, flags, etc .....	\$5,000
<b>Total material and supplies .....</b>	<b>\$5,000</b>

**C. Travel (Domestic)**

Travel Costs .....	\$10,200
Lodging and meals .....	\$5,000
<b>Total travel expenses .....</b>	<b>\$15,200</b>

**Total required funds for year 2 .....**\$59,880

**YEAR 3 (2010)****A. Salaries and wages**

Graduate student .....	\$22,000
Summer student helpers .....	\$10,640
Fringe benefits .....	\$7040
<b>Total salaries, wages and benefits.....</b>	<b>\$39,680</b>

**B. Materials and Supplies**

Herbicides, additives, paper bags, flags, etc .....	\$5,000
<b>Total material and supplies .....</b>	<b>\$5,000</b>

**C. Travel (Domestic)**

Travel Costs .....	\$10,200
Lodging and meals .....	\$5,000
<b>Total travel expenses .....</b>	<b>\$15,200</b>

**Total required funds for year 3 .....**\$59,880

In addition to applied research and demonstration, the publication of research data along with development of an Extension publication and video regarding "Best Management Practices" to be used as public education and awareness would be suggested as a complimentary component of this project. Funding needs for publication are estimated to be as follows:

**Publication cost:**

Video documentation .....	\$5,000
Research manuscripts: 2 manuscripts x \$2000 (year three).....	\$4,000
Extension publication: 20,000 copies (year three) .....	\$20,000
CD production: 10,000 copies (year three) .....	\$20,000
<b>Total publication cost .....</b>	<b>\$49,000</b>